1) The temperature in $°C$ of a pot of water removed from the cooker is given by $T(m) = 20 + 70 \cdot 2.72^{-0.4m}$, where m is the number of minutes after the pot is removed from the cooker.

A) Show that the temperature of the water when it is removed from the cooker is $90°C$.

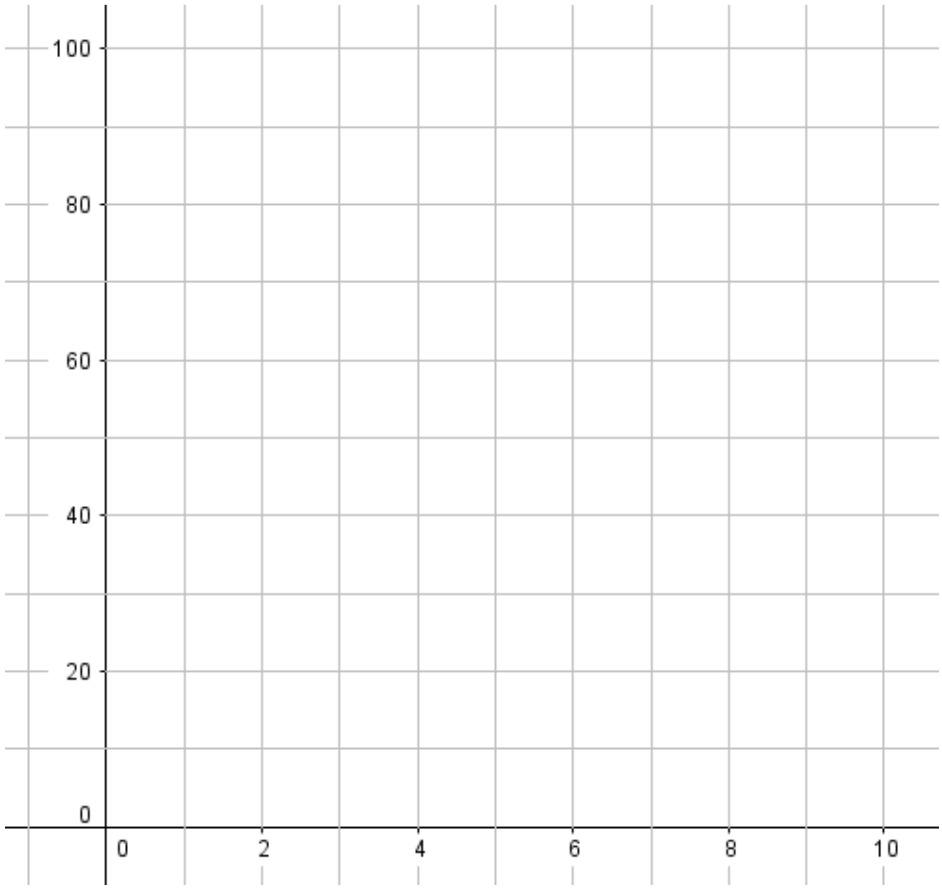
The following table shows values for m and $T(m)$.

m	1	2	4	6	8	10
$T(m)$	66.9	51.4	34.1	26.3	22.8	s

B)

I) Write down the value of s.

II) Draw the graph of $T(m)$ for $0 \le m \le 10$. Use a scale of $1\,cm$ to represent 1 minute on the horizontal axis and a scale of $1\,cm$ to represent $10°C$ on the vertical axis.



III) **Use your graph** to find how long it takes for the temperature to reach $56°C$. Show your method clearly.

IV) Write down the temperature approached by the water after a long time.
Justify your answer.

Consider the function $S(m) = 20m - 40$ for $2 \le m \le 6$.

The function $S(m)$ represents the temperature of soup in a pot placed on the cooker two minutes after the water has been removed. The soup is then heated.

C) Draw the graph of $S(m)$ on the same set of axes used for part B).

D) Comment on the meaning of the constant **20** in the formula for $S(m)$ in relation to the temperature of the soup.

E)

I) **Use your graph** to solve the equation $S(m) = T(m)$. Show your method clearly.

II) Hence describe by using inequalities the set of values of m for which $S(m) > T(m)$.

2) In an experiment it is found that a culture of bacteria triples in number every four hours.
There are 200 bacteria at the start of the experiment.

Hours	0	4	8	12	16
No. of bacteria	200	600	*a*	5400	16200

A) Find the value of a.

B) Calculate how many bacteria there will be after one day.

C) Find how long it will take for there to be two million bacteria.

3) The number of cells, C, in a culture is given by the equation $C = p \cdot 2^{0.5t} + q$, where t is the time in hours measured from 12:00 on Monday and p and q are constants.

The number of cells in the culture at 12:00 on Monday is 47.
The number of cells in the culture at 16:00 on Monday is 53.

Use the above information to:

A) Write down two equations in p and q.

B) Calculate the value of p and of q.

C) Find the number of cells in the culture at 22:00 on Monday.